Chapter 8.0 Mine Plan

8.0 Mine Plan

8.1 Construction

The construction of the process plant and initial production area will proceed simultaneously. Immediately following the issuance of the required authorizations the construction phase will begin. Based on past experience, the construction phase will take approximately 9 months.

8.2 Operations and Restoration

The estimated life of the project is 9 years, including restoration of the production areas. Table 8.1 Mine Plan summarizes the production, restoration, stability and administrative periods of the project. These periods are given for all four production areas. The stability period will last for at least 180 days to demonstrate to the satisfaction of TCEQ that the restored water quality is stable and will not rebound to values exceeding the restoration table limits. The administrative period is the time associated with data submittals by UEC to report restoration progress (semi-annual restoration reports) and stability data as required in § 331.107), agency reviews and agency approvals.

Previously referenced Figure 1.3 Project Map shows the location and acreage of the four production areas. It was noted in earlier chapters of this application that the production zones represent four distinct sand units; namely Sand A, Sand B, Sand C and Sand D. For mining purposes, the individual production areas are subdivided into smaller units called modules.

As shown in Table 8.1, UEC will be conducting restoration at the same time that recovery operations are occurring. Restoration activities will begin as soon as hydraulic separation can be established between modules that have been depleted of uranium and those that are being produced. Based on many years of experience, UEC believes that restoration goals can be more quickly achieved by beginning restoration as soon as possible. UEC also believes that the use of R.O. in the mining process will accelerate the restoration process.

8-1

Table 8.1

Mine Plan

Legend:
- Production
- Restoration
- Stab. (Stability Period)
- Restored (Well Field Reclamation)
- Admin. (Closeout Processing)

Years: 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017

Production Areas:
- Module 1
- Module 2
- Module 3
- Module 4
- Module 5
- Module 6
- Module 7
- Module 8
- Module 9
- Module 10
- Module 11
- Module 12
- Module 13
- Module 14
- Module 15
- Module 16

PAA #1, PAA #2, PAA #3, PAA #4
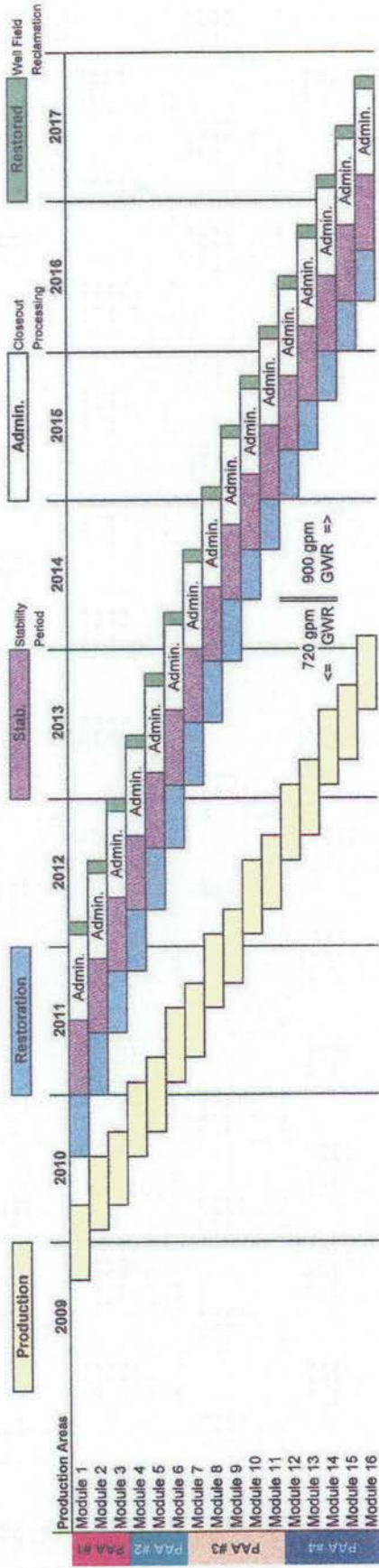
720 gpm GWR <= | 900 gpm GWR =>

Figure 1.3 Project Map (see Map Appendix)

Given this approach, it is assumed that restoration targets can be met with 6 pore volumes; the pore volumes being a blend of native groundwater and purified water from the R.O. units. A blend of R.O. purified water (permeate) with native groundwater will be circulated throughout the mine zone to remove constituents that are temporarily elevated during the uranium recovery phase. This process will continue until water quality in the ore zone is restored to levels consistent with pre-mining uses for this portion of the aquifer. During the restoration period, water quality improvement is extensively sampled on a routine basis, and progress is documented in semi-annual restoration progress reports that are filed with TCEQ. Reverse osmosis reject (approximately 30% of the water that passes through the units) will be disposed in a Class I Non-hazardous Waste Disposal Well(s).

8.3 Well Plugging

An estimated total number of wells and a plugging cost are given in Section 13.0. Restoration: Well Plugging and Abandonment. With respect to plugging, UEC will follow the rules given in 30 TAC §331.86 Closure. Briefly, UEC will complete well plugging within 120 days after receiving official acknowledgment from TCEQ that restoration is complete. Plugging will be in accordance with a TCEQ-approved plugging plan.

Plugging of Class III wells is accomplished by removing all equipment from the well and cementing it from total depth to the surface. After the cement has been allowed to dry, the casing is cut off to a level approximately 3 feet below surface grade. The hole is then backfilled with native soil and graded to approximate the natural contour of the land. Following this stage, TCEQ is notified and will conduct a verification inspection.

The affixed seal covers the entire contents of this chapter.

STATE OF TEXAS
HARRY L ANTHONY IV
47592
REGISTERED
PROFESSIONAL ENGINEER

Jan 30, 2008

9.0 Wellfield and Process Facility Details

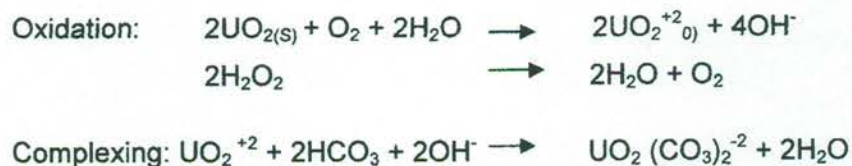### 9.1 Wellfield and Operations Description

A wellfield typically consists of a series of injection and production wells measuring up to 6 inches in diameter that are connected to the process facility via larger diameter trunk lines. Trunk lines typically measure 8 to 10 inches in diameter. Well casing for injection and production wells is made of PVC whereas trunk lines can be either PVC or high density polyethylene (HDPE). Apart from injectors and producers, production zone and non-production zone monitor wells also are part of the wellfield. As with the production and injection wells, monitor well casing is made of PVC. The previously referenced Project Map (see Figure 1.3 in the Appendix) shows the initial wellfield layout, process facility location, preliminary disposal well location, initial aquifer exemption boundary, permit boundary, initial production area acreages, drainages, faults, roads, and other features.

Trunk lines are used to transport pregnant lixiviant from the wellfields to the process plant and to return re-fortified barren lixiviant to the wellfield injectors. Pregnant lixiviant is simply uranium-bearing solution that has been created by mobilizing the uranium in the ore zone with an oxygen-rich, pH-controlled, bicarbonate solution. As the uranium is mobilized in the ore zone, it is transported to the surface via production wells and piped to the recovery plant for stripping and further processing. After the uranium is removed, the fluid stream is re-fortified with chemicals and returned to the wellfield to repeat the process of mobilizing and recovering uranium. Because it does not contain uranium, the fluid stream returning to the wellfields is called barren lixiviant.

Barren lixiviant consists of native groundwater supplemented with bicarbonate ions and oxygen. Before being pumped to the wellfield injectors, the fluid passes through micro filters to remove solids.

9-1

The solution is pH controlled, normally in the range of 6.8 to 7.4 with gaseous CO_2, and the bicarbonate concentration is kept in the range of 400 to 1000 PPM with a buffering agent such as NaOH. As barren lixiviant is circulated through the wellfield, its oxygen content is consumed and therefore its oxidation potential must be enhanced through the addition of oxygen, or hydrogen peroxide in the range of 200 to 400 PPM as O_2. As lixiviant is recycled, total ion concentration increases over time. Since high ion concentrations are not conducive to efficient mining, they can be lowered using reverse osmosis (R.O.). Minimizing the concentrations of SO_4, Ca, Fe, Mo, Ra-226, SiO_4, and other elements is desirable. The use of R.O. in the mining process not only boosts recovery efficiency, it maintains a cleaner wellfield. By minimizing the elevation of these and other constituents, restoration will also be made easier. Another good feature of R.O. is that it conserves water.

The lixiviant just described is designed to efficiently mobilize the uranium ore which is normally found in reduced sand. To recover the uranium from this environment, the ore must first be converted to a soluble form ($UO2^{+2}$) this is accomplished through oxidation. Following this phase, the uranyl cations complex with bicarbonate anions, forming a uranyl dicarbonate complex. The chemical equation below outlines the process of dissolving and complexing the uranium in-situ:

Oxidation: $2UO_{2(S)} + O_2 + 2H_2O \longrightarrow 2UO_2^{+2}{}_{0)} + 4OH^-$

$2H_2O_2 \longrightarrow 2H_2O + O_2$

Complexing: $UO_2^{+2} + 2HCO_3 + 2OH^- \longrightarrow UO_2(CO_3)_2^{-2} + 2H_2O$

Both pregnant and barren lixiviant streams are monitored for total flow volume in and out of the wellfield.

For process control purposes, pregnant lixiviant from each production wellfield is metered and totaled. Average and maximum daily rates and volumes of injection vary according to the formation, plant capacity and wellfield size. Injection pressure does not exceed 0.40 psi per foot of well depth nor does it exceed the internal burst rating of the casing. In addition, records on daily flow rates of individual production wells are maintained.

9.2 Process Facility Description

Figure 9.1 shows the layout of the process plant equipment, dryer building, chemical storage area, yellowcake product storage and passageways. The plant is a down flow design that will have a maximum lixiviant flow rate of 5,000 gpm. At start up, however, Uranium Energy Corp expects to be operating at a flow rate of 1,000 to 1,500 gpm. Later, as additional wellfield production areas are brought into service, the maximum design flow rate of 5,000 gpm will be reached.

Pregnant lixiviant will be received from the wellfields through large-diameter trunk line. This line branches into two lines that feed the down flow sand filters. The filters are 6 feet in height (straight side) and 11 feet in diameter. The down flow sand filters remove suspended particles with a particle diameter of 2 microns or greater from the lixiviant. Normally, three of the filters will be in operation simultaneously while the forth is being back-washed. Although they are referred to as sand filters, their content may consist of fine garnet, pea gravel and larger gravel. It was noted above that the sand filters are back-washed. Back washing is necessary to maintain the effectiveness of the sand filters. Effluent from this cleaning process will be contained in the backwash tanks. The Backwash Tanks are cone bottomed. Backwash fluids enter through the side, just above the cone bottom. Sand and silt collect in the bottom cone and are removed when a layer begins to accumulate. Clear water exits the top of the tank after flowing upward through layers of settled and fine suspended solids.

9-3

Figure 9.1 (see Map Appendix)

The suspended solids impinge and coalesce with the upward moving solids, enhancing overall solids removal. Two backwash tanks are arranged in parallel, thereby reducing velocity for maximum solids removal.

As shown in Figure 9.1 there are 10 IX vessels. The production IX vessels are 6 feet high, measured along the straight side by 11 feet in diameter, and capped with 2:1 elliptical heads. The restoration IX columns are 10 feet in diameter. Each vessel will contain approximately 500 ft^3 of Dow 21-K, 16-30 mesh resin, or its equivalent. The vessels are arranged in groups of two. Each group will have a lead vessel and a trailing vessel, and each group has a maximum flow rate of 1250 gpm. When loaded with uranium, resin is hydraulically transferred from the lead vessel to an empty elution vessel. Previously stripped resin is transferred from a second elution vessel to the empty IX vessel. By the use of valves, the vessel containing the stripped resin is placed in the trail position and the vessel with resin previously in the trail position is moved to the lead position.

Solution entering the vessel passes through an 8 inch diameter distributor pipe that divides the flow into four streams. The streams flow downward through the resin and exit via a lower collection header. To prevent resin loss, the collection header is equipped with drop pipes that are fitted with fine mesh screens. The drop pipes are located equally throughout the resin bed to prevent channeling of lixiviant. After passing through the vessel, spent solution is routed by pressure through piping to injection booster pumps.

Four centrifugal pumps, each with a 1250 gpm flow rate, will be connected in parallel to an outlet header. This configuration allows a combination of pumping choices, depending on flow rate. As fluid exits the pumps, it passes through resin traps. The design has four resin traps (each with a 1250 gpm capacity).

9.3 Process Description

To aid the reader in following the process description given here, please refer to Figure 9.2 Goliad Plant Process Flow Diagram. The process begins when pregnant lixiviant is received from the wellfield. Uranium is removed from the lixiviant and concentrated by ion exchange (IX). The IX vessels contain a polymeric resin chemically designed to capture complexes of uranyl carbonate ions. Therefore, as pregnant lixiviant passes downward, over the resin, uranium is removed from the stream. At this point, the lixiviant flows from the IX vessels through resin traps. Stripped of its uranium, the barren solution, as described earlier, is refortified before being returned to the wellfield. Also noted earlier, a portion of the barren lixiviant can be treated with R.O. and chemically refortified before it is re-injected in the wellfields. In this case, the purified stream is used as mining solution and the reject stream is sent to the waste storage tanks for disposal via deep well injection. It should also be remembered that a small percentage of barren solution is disposed of to maintain a cone of depression in the wellfield.

When the IX resin becomes maximally loaded with uranyl dicarbonate, the vessels are taken off-line, the resin is removed from the vessel, and the resin is treated for the recovery of uranium - - this part of the process is called elution. A solution, rich in chloride ions (eluant), is used to strip the loaded resin of uranium. Three tanks measuring 14 feet in diameter by 18 feet in height are used for barren, recycle and make-up eluant storage. Chloride ions in the eluant solution exchange with uranyl dicarbonate ions on the resin sites causing the uranium dicarbonate ions to leave the resin sites and become soluble in the eluant solution, forming a pregnant eluant. Following elution, the resin is placed back on line to repeat the process of capturing uranium.

Fig. 9.2 Goliad Plant - Process Flow Diagram
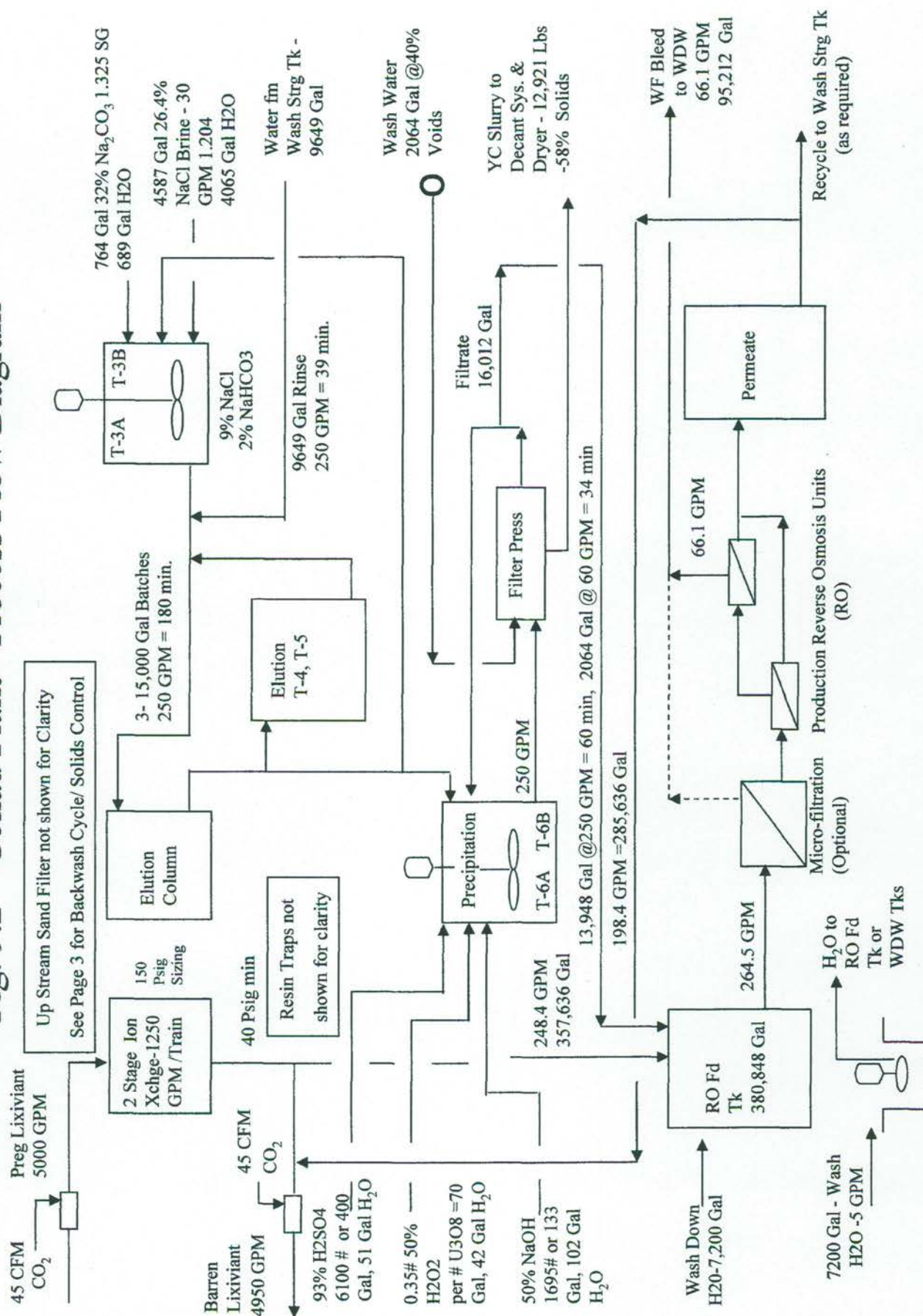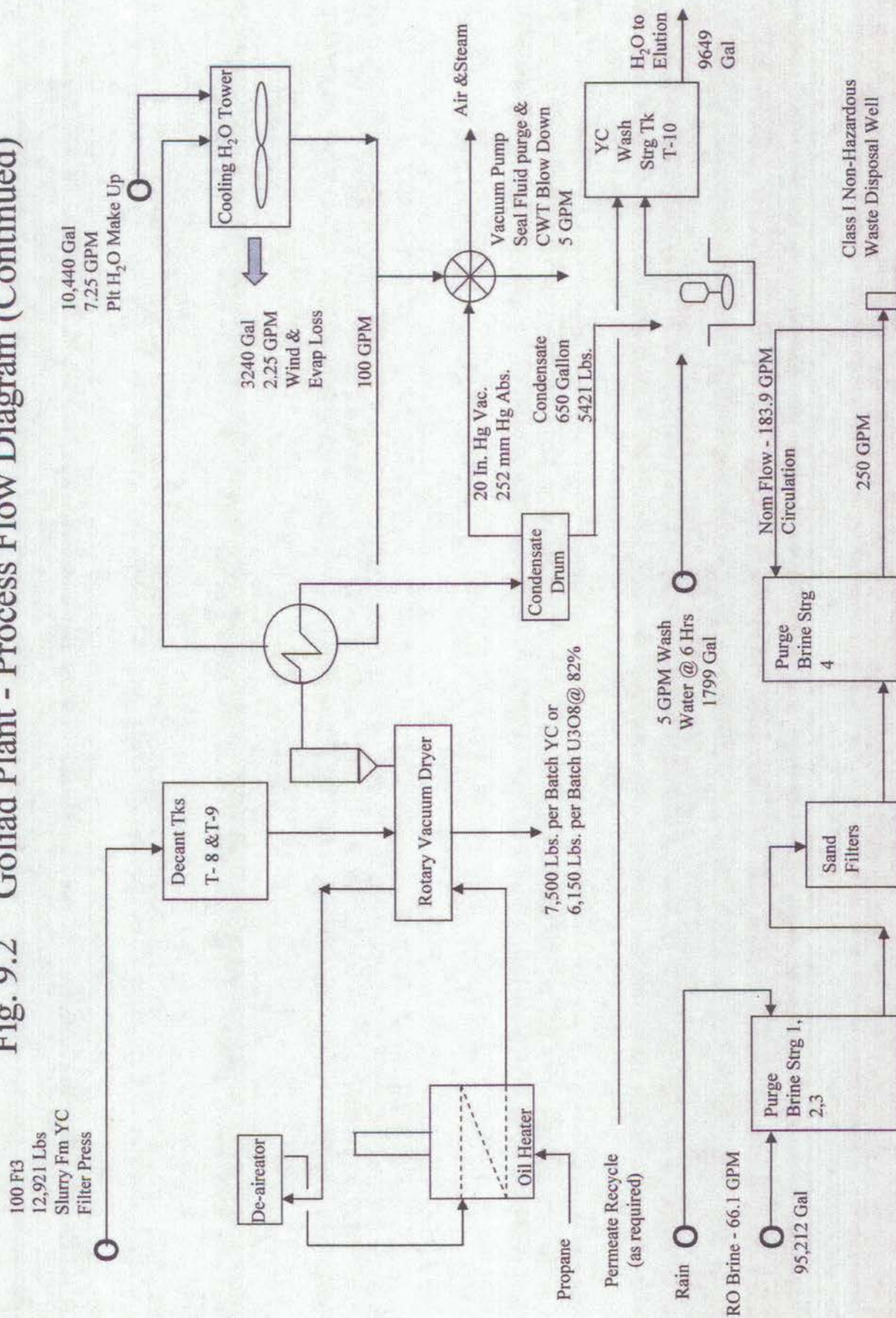
Fig. 9.2   Goliad Plant - Process Flow Diagram (Continued)

Fig. 9.2   Goliad Plant - Process Flow Diagram (Continued)

Water fm Plt Water Tk

Xfer H2O Tank
T-20

125 GPM

IX Column
or Trailer

40 GPM

280 GPM

320 GPM

Elution
Column
V-1 A or B

Xfer H2O Tank
T-20

125 GPM

Elution
Column
V-1 A or B

40 GPM

280 GPM

320 GPM

IX Column
or Trailer

Fig. 9.2 Goliad Plant - Process Flow Diagram (Continued)

Fm Plt H2O Tk - Start Up

Fm Other Sand Filters

To Other Sand Filters

1000 GPM - 5 min

Sand Filter
Typ.1 0f 6

Backwash Tk
T-21 B

Backwash Tk
T-21 A

Screens

Sand & Silt to 11(e)-2 Disposal
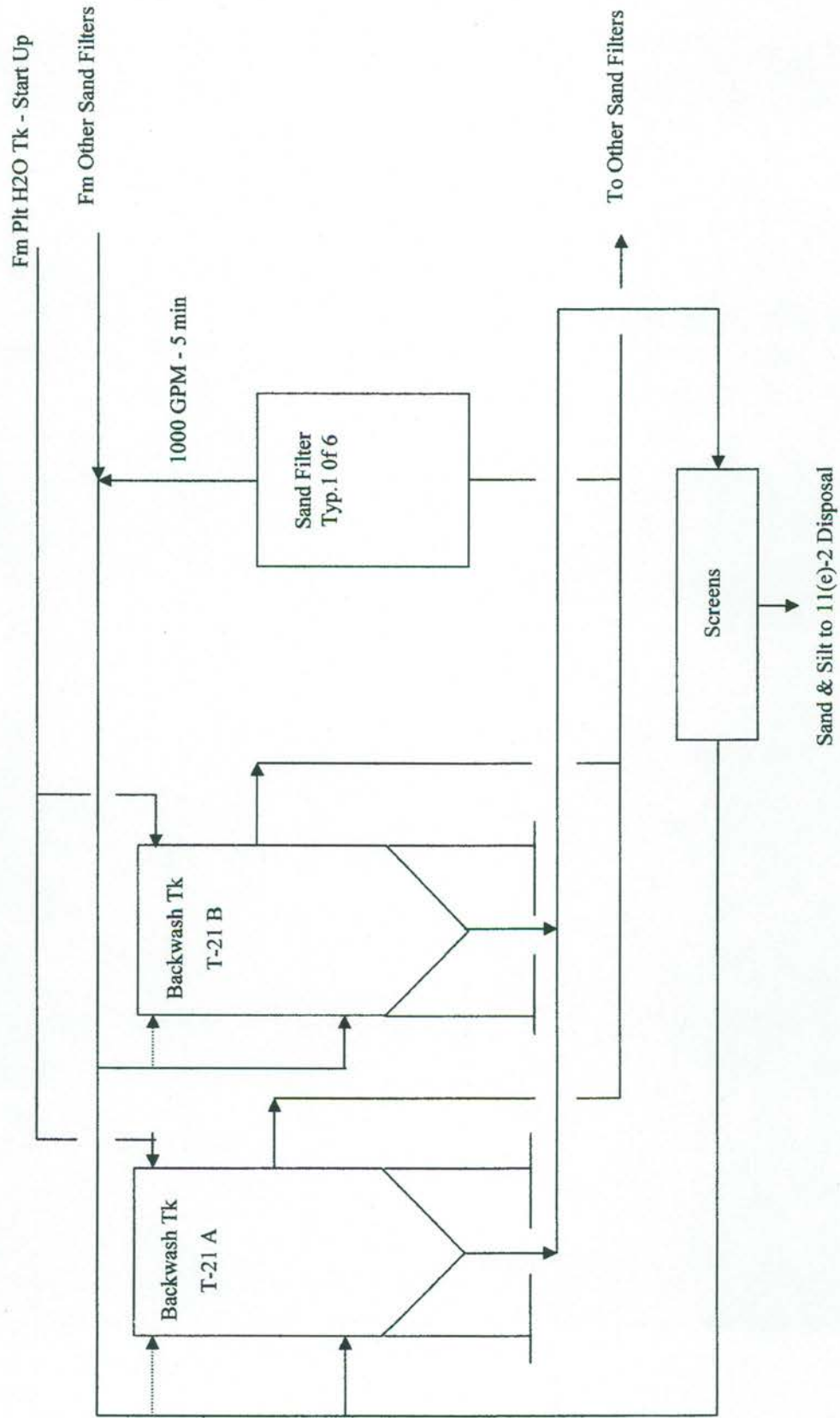
Fig. 9.2 Goliad Plant - Process Flow Diagram (Continued)

For the process just described, loading and elution of uranium is summarized in the following equation:

Loading: $2RCl + UO_2(CO_3)_2^{-2}$ $\longrightarrow$ $R_2UO_2(CO_3)_2 + 2Cl$

Elution: $R_2UO_2(CO_3)_2 + 2Cl^- + HCO_3 + OH$ $\longrightarrow$ $2RCl + UO_2(CO_3)_3^{-4}$

H_2O
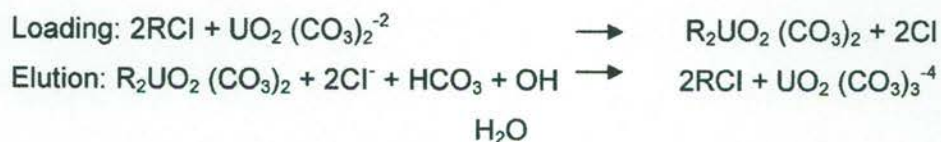
Note: R denotes resin

The pregnant eluate is either temporarily held in a storage tank for use in removing additional uranium from other beds of resin or is routed to the system's precipitation phase. Two batch precipitation tanks are the primary components of the system. The tanks contain internal baffles and agitators for mixing. Pregnant eluant is batch precipitated following the procedure described below.

During precipitation, the uranium in the pregnant eluant is phase-converted from a dissolved ion to a solid. Pregnant eluant is treated with hydrochloric or sulfuric acid, breaking down the uranyl dicarbonate, producing carbon dioxide gas and soluble uranyl ions. Hydrogen peroxide is added to initiate oxidation of the uranyl ions. Once oxidized, the ions form insoluble uranyl peroxide. Sodium hydroxide is then added to neutralize the by-product of the reaction acid, enhancing crystal growth. The precipitation process in equation form is as follows:

Acidification: $UO_2(CO_3)_3^{-4} + 6HCl$ $\longrightarrow$ $UO_2^{+2} + 6Cl^- + 3H_2O + 3CO_2(g)$

Oxidation: $UO_2^{+2} + H_2O_2$ $\longrightarrow$ $UO_2O_{2(s)} + 2H^+$

Neutralization: $UO_2O_{2(s)} + H^+ + NaOH$ $\longrightarrow$ $UO_2O_{2(s)} + Na^+ + H_2O$
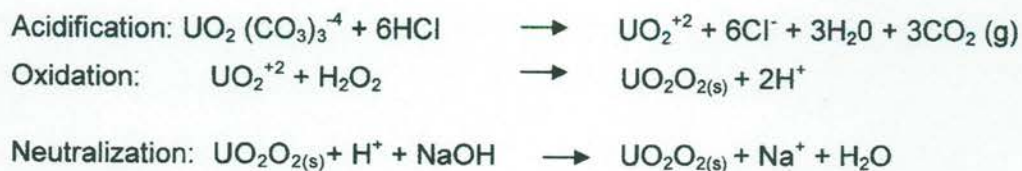
At the completion of the precipitation stage, yellowcake slurry is filtered and the filtrate is returned to the eluant tanks for re-fortification and re-use. To reduce contaminant buildup, a portion of the filtrate stream is sent to the waste storage tanks for disposal.

Yellowcake solids are washed with purified water, R.O. permeate, for example, to remove residual contaminants such as chlorides. The rinse water from this process is sent to the elution make-up tank for reuse or to the waste storage tanks for disposal. Yellowcake slurry is then removed from the filter and held in one of two 45,000-pound capacity storage tanks until it is transferred to the dryer.

The operation will include a state-of-the-art rotary vacuum dryer. Modern rotary vacuum dryers are recognized by the U.S. Nuclear Regulatory Commission (NRC) as having near-zero particulate emissions. The dryer will be batch fed and each batch will consist of up to 100 ft^3 of 50% to 60% solids) solids yellowcake slurry. A slurry batch will contain up to 7,500 pounds of yellowcake solids or about 6,150 pounds of dry U_3O_8.

At the completion of drying, the product will be loaded into U.S. Department of Transportation (USDOT) approved 55 gallon steel shipping containers. Packaging equipment will be located beneath the dryer to facilitate direct loading from the dryer into the shipping containers. This packaging system is designed to operate with a minimal amount of particulates. After the containers are filled, they will be allowed to cool for a period of time before being tightly sealed. The containers will be temporarily stored in the product storage area prior to shipping. A batch can be dried daily if needed.

9.4 Spill Control

The reinforced concrete process pad (17,100 Ft^2) and dryer building pad (3600 Ft^2) are designed with twelve -inch high curbs, sumps and storage tanks to prevent runoff.

The twelve-inch curbing generates 132,559 gallons of retention capacity on the process pad, once the cross sectional area or footprint for the process equipment on the pad (2979 Ft^2) is removed. In addition, the holding capacity of the sump system is 1044 gallons, for a total of 133,602 gallons of retention capacity. An adjoining but isolated section of pad will contain the yellowcake slurry processing and storage equipment, as well as, by-product materials. This pad is also designed to prevent runoff. It too will have a twelve-inch high curb around it. At one end, an entrance ramp slopes upward to the height of the curbing. The pad will slope downward from the entrance ramp toward a sump system. This design will allow wash water or spills to collect in the sump system and be pumped to the waste storage tanks. This sump system will be designed to have a holding capacity of approximately 925 gallons. The total surface area of the pad is 6000 ft^2. Including the sump, the pad will have a total holding capacity of 42,523 gallons once the cross sectional area or footprint of the process equipment on the pad (169 Ft^2) and the ramp (270 Ft^2) is subtracted.

Acid and hydrogen peroxide will be stored on a separate 55 ft by 20 ft storage pad that is also designed with twelve inch high curbs and a sump. The twelve-inch curbing generates 7640 gallons of retention capacity, once the cross sectional area for the acid tank (78.5 ft^2) is removed. The cross sectional area for the hydrogen peroxide tank is in significant in that the tank is elevated above the pad on steel supports. A sump adds 202 gallons to the pad's holding capacity, providing a total holding capacity of 7843 gallons.

Four 46,038-gallon, above ground tanks (WDW Storage Tanks) are provided for the storage of waste fluids before disposal. The total storage capacity of the WDW Storage Tank system is 184,152 gallons. Each tank has a specified inside diameter of 14 ft and a side wall height of 40 ft. All four tanks will include a flat bottom, dome top, and will be constructed of Fiberglass Reinforced Plastic (FRP). The FRP tanks will be designed and manufactured utilizing advanced, automatic chopped hoop filament winding and end bell machines to meet or exceed ASTM D3299, ASTM D4097, and SPI's Quality Assurance Report, as applicable. Standard Quality Assurance in-process tests will be conducted during the tank manufacturing process and recorded.

The fabricators of the tank will also hydro-test each tank at the end of the manufacturing process. Should any leaks be discovered, the affected areas will be repaired and the tank will be re-tested. Additionally, each tank will be hydro-tested by UEC following installation at the project site. Again, should any leaks be discovered, the tanks will be repaired and re-tested prior to use.

9.5 Rain and Emergency Operations

During a rain event or emergency condition, fluids impacting the pads are directed to the sump systems by the positive (gravity flow) draining, downward sloping floor. From the sumps, the collected liquids are pumped to the WDW Storage Tanks. From the WDW Storage Tanks, all waste fluids are routed to the WDW(s).

During a 25-Year rain event, approximately 8.5 inches of rain would fall within a 24- hour period. During this event, approximately 141,470 gallons would fall onto the main Process, Drying, By-Product and Yellow Cake Storage Pads. The separate chemical pad would receive 5830 gallons during this same event. In total, 147,300 gallons of rain would collect on the process and chemical pads while 184,152 gallons of storage are provided. The four waste storage tanks provide enough capacity to contain a 25 year rain event while maintaining 36,852 gallons of "spare" capacity. The combined slab and sump storage capacity of 183,970 gallons adds additional reserve capacity.

9.6 Typical By-product Wastewater Composition.

Byproduct waste fluids produced by in situ recovery operations in South Texas will vary from one operation to another, depending on differences in the mining formation and slight differences in processing techniques. For the most part, however, the values shown in Table 9.1 provide a typical concentration of the waste solution.

Table 9.1 Typical Byproduct Wastewater Composition

Parameter	Concentration*	Parameter	Concentration*
Ca	550	Alk	565
Mg	140	pH (S.U.)	7-8
Na	1275	As	0.015
K	35	Cd	<0.0001
CO_3	0	Fe	2.5
HCO_3	565	Pb	<0.001
SO_4	1650	Mn	<1.0
Cl	2385	Hg	<0.0001
NO_3-N	0.1	Mo	15
F	<1.0	Se	0.01
SiO_2	40	U	15
TDS	9400	Ra-226 (pCi/l)	200
EC (µmhos)	12,800		

*Estimated composition is based on typical average values reported at other in-situ process sites.

9.7 Well Completion, Construction and Mechanical Integrity

9.7.1 Construction and Completion

Well construction and completion will conform to Class III well standards described in §331.82 Construction Requirements. Figure 9.3 is a schematic showing a typical injection and recovery well that UEC would use in the wellfields. As the diagram shows, wells vary in diameter from 4 inches to 6 inches. The casing is schedule 40 PVC. After drilling the hole, it is logged using electric and gamma logging tools to determine subsurface geology. The hole is then reamed out to a larger diameter (often 7 7/8 inches) through the target sand to receive the PVC casing. Casing is then run into the hole to total depth. Casing joints are primed, glued and secured with sheet metal screws. Centralizers are placed at 100-foot intervals. Once the casing is in place, it is cemented through weep holes located near the bottom-most casing. All wells are cemented from total depth to the surface with Type I Portland cement. The cement is then allowed to dry for several days before proceeding to mechanical integrity testing (MIT). Once a well passes MIT, additional development follows.

Target sands are selectively drilled out to a larger diameter than the casing. This is known as undereaming. An underreamed interval is typically between 10 and 11 inches in diameter. A screened liner is then placed into the zone that has been underreamed (see Figure 9.3). The next stage involves placing a filter pack or sand pack between the well screen and the formation. This is done to keep an unconsolidated formation from caving in around the screen. Sand packing also improves the performance of a well. Well stimulation (see § 331.122(2)(H) is not needed for production and recovery wells. Stimulation is a procedure typically used in disposal wells. Finally, the well is logged through the screen to verify proper placement in the ore zone. Monitor wells are built in the same manner as the injectors and producers but the main difference is that monitor wells normally do not have permanent pumps installed.

Revised: February 26, 2008

FEMALE ADPT

4", 5", or 6" PVC WELL CASING

TYPE I PORTLAND CEMENT

DRILL HOLE

CASING CENTRALIZER – Typ.
Approx. 100 Ft Spacing

PACKER ASSEMBLY

J – COLLAR – STEEL

STEEL SWEDGE

TYPE K PACKER RUBBER

PIPE – GALV

SCH 80 PVC PIPE

SLOT WELL SCREEN

UNDERREAM DEPTH CUT

GRAVEL PACK

BUSHING – PVC

PVC SWING CHECK VALVES
INVERTED

NOTE:
ALL FITTINGS PRIMED, GLUED AND
FASTENED WITH SHEET METAL SCREWS.

SURFACE

UPPER CLAY

UPPER SAND

MARKER CLAY

LOWER SAND

2'

7-27-2007

STATE OF TEXAS
HARRY L. ANTHONY IV
47592
REGISTERED
PROFESSIONAL ENGINEER

UEC
Uranium Energy Corp

JOB NO.

DATE: JULY 29, 2007

SCALE: N.T.S.

APPROVED BY: HA

DRAWN BY: CB, JON

DRAWING NO. Figure 9.3

REV. DATE

DESCRIPTION

FIG. 9.3 - GOLIAD PROJECT

DOWNHOLE DESIGN
DIAGRAM

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9.7.2 Mechanical Integrity Testing

As noted above, all Class III wells will be tested for mechanical integrity prior to being placed into service. The procedures that will be followed are given in 30 TAC §331.43. Testing involves pressuring a well up to 100 psi and allowing it to stand for 30 minutes before taking another pressure reading. If the pressure remains within 10% of the initial 100 psi, the well passes the test. Single point resistivity logging is also used in performing MIT. In addition, completion reports (cementing records, well diagrams, casing records) and logging are used to evaluate the integrity of a well.

9.7.3 Excursion Prevention and Corrective Action

Protection of underground sources of drinking water is the single most important goal of UEC's proposed operation. To this end, UEC will employ a number of time-proven mechanisms to ensure this valuable resource is fully protected. Following is a summary of how in situ uranium recovery operations operate without impacting good quality groundwater.

To prevent mining fluids from migrating vertically and horizontally from the production zones, UEC will maintain a negative sink in the production areas to force native groundwater to flow inward toward the areas being produced. This negative pressure gradient system will remain in place throughout operations and until the affected production zones have been fully restored to pre-mining uses. The cone of depression just noted is created by removing more water from the production zone than is being injected. The terms used to describe this safety mechanism are: overproduction and production bleed. To ensure that the effectiveness of this protective measure does not become degraded, bleed will be carefully monitored using in-line totalizers. In addition to this, other important operational procedures will be in place to ensure that fluids from the production zones remain confined. For example, water levels in the monitor wells will be measured on a routine basis. A third element in the excursion detection/prevention plan involves routine water quality monitoring. TCEQ requires routine analysis of water from the production and non-production monitor wells.

Figure 9.4 shows a generalized pattern of monitor wells. Designated monitors wells will be monitored every two weeks for what is known as Control Parameters. Control parameters are simply water quality constituents that would provide the earliest indication of a possible excursion. Because of its rapid movement, chloride provides the earliest warning. Other candidates include electrical conductivity (EC), TDS and sulfate. Sulfate, however, is not as reliable as chloride in that native sulfate levels can cause what is known as false positives. In other words, an increase in sulfate might be proof of an excursion. In the past, uranium was used as one of the control parameters but it is well understood that it is a poor choice in that it does not readily move through groundwater. Since it does not readily move, it cannot serve as an early warning sign. Recognizing this, the U.S. Nuclear Regulatory Commission (NRC) does not allow uranium to be used as a control parameter, and recently TCEQ has adopted this same view.

If a control parameter equals or exceeds the upper control limit set by TCEQ, a verifying analysis must be completed within two days. If the verifying analysis indicates that mining solutions are present in a designated monitor well, an operator shall initiate corrective measures as set out in 30 TAC §331.106 Remedial Action for Excursion. This provision of the rules has three major requirements: 1) notice the TCEQ Regional Office by telephone within 48 hours and file a written letter with the Executive Director, postmarked within 48 hours of the event; 2) prepare a comprehensive groundwater analysis report; and 3) clean up all designated monitor wells, all zones outside the production zone and the production zone outside the mine area.

A fourth safeguard for ensuring maximum groundwater protection is the well design itself. In the previous section of this report, well construction and completion was presented for the Class III wells used in uranium recovery operations. Class III wells are not only built to higher standards than a typical domestic water well, they are tested for mechanical integrity. Mechanical integrity testing is a fifth protective measure. It should also be noted that if equipment is used to enter well for maintenance or other reasons after an MIT was completed, the well must be re-tested for integrity.

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Figure 9.4 SAMPLE PROPOSED PRODUCTION AREA MAP

NATIONAL MINING COMPANY

Sample

Mine Area A

Scale in Feet

EXPLANATION

● Injection Well

○ Production Well

◉ Monitor Well

Mine Area Boundary
(22.4 acres)

Depth to top of Production Zone - 300 feet
Elevation of Production Zone - 200 feet above mean
sea level to 50 feet below mean sea level.

Production Area Boundary
(11.8 acres)

2-26-08
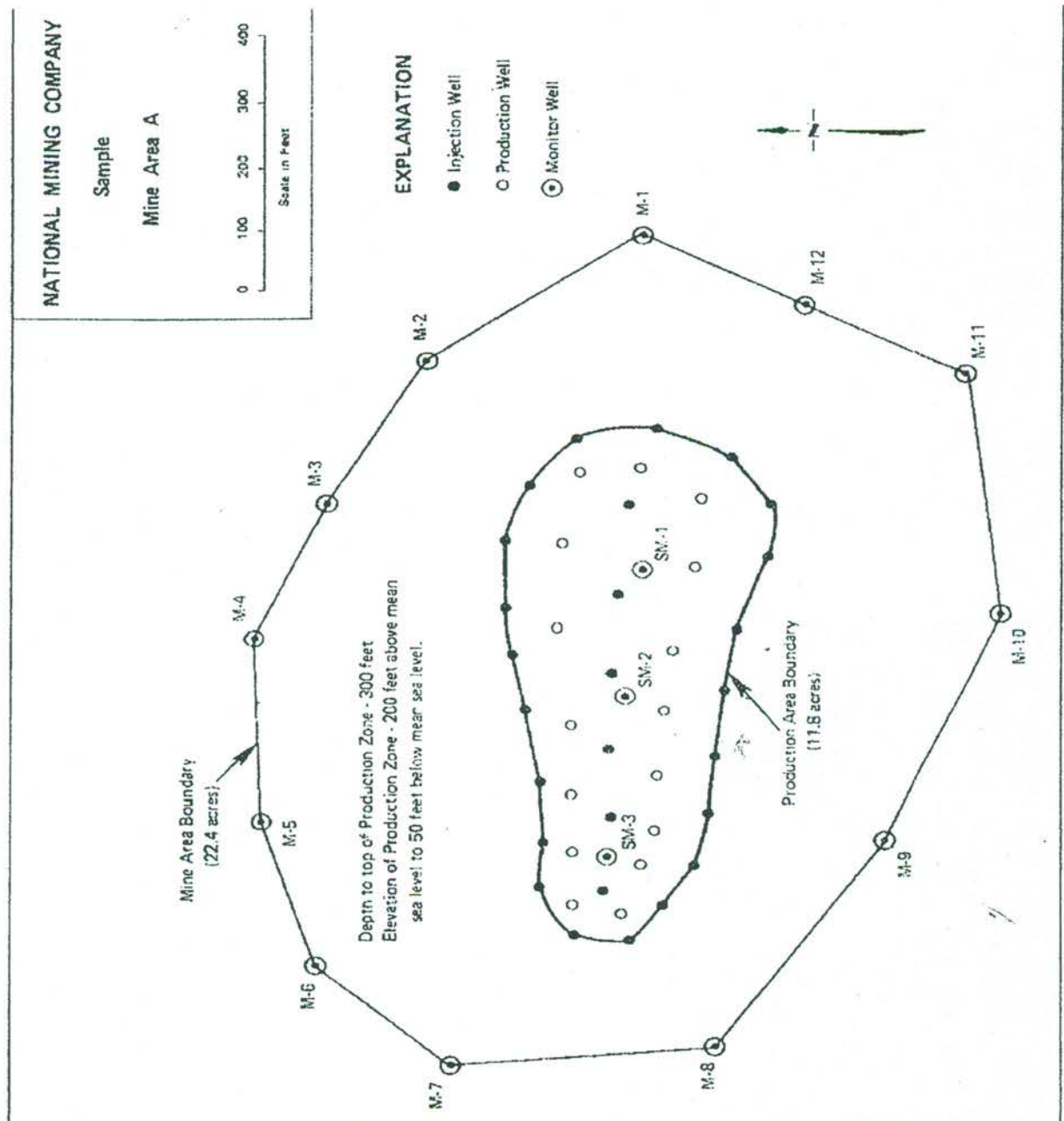
A fifth protective measure includes the requirement to monitor specified wells within a ¼ mile of the injection site at least every three months.

A sixth protective measure includes continuous monitoring of injection pressure. Pressure gauges are placed on all injection wells and manifolds, and the maximum injection pressure is conspicuously marked on the gauges. Routine inspection and reporting by UEC personnel and TCEQ inspectors will ensure a high degree of safety.

A seventh measure of protection involves corrective action that would be taken in the unlikely event of well failure. Because of the high construction standards to which Class III wells are built and because of mechanical integrity testing prior to use, well failure is uncommon. However, in the event of a failure, the well would be removed from service and investigated to discover the reason for failure and to locate the failure point in the casing. Potential leakage into overlying, non-exempt aquifers would be detected by monitor wells. If monitoring results verify an excursion, corrective action will be taken in accordance with § 331.106 Remedial Action for Excursion.

Following documentation of the event and verification by TCEQ, the well would be plugged and abandoned in accordance with an approved plugging plan filed with TCEQ. If needed, a new well would be completed in the production pattern. Completion of a new well would follow the criteria for Class III wells.

Chapter 10.0 Fluid Handling Capacity vs. Requirements

7-27-2007

The affixed seal covers the entire contents of this chapter.

10.0 Fluid Handling Capacity vs. Requirements

Using TCEQ's Technical Guide III, a detailed assessment was completed for the project's fluid handling requirements. Table 10.1 provides a comprehensive summary of the fluid sources and their respective volumes throughout the life of the project. A measure of conservatism, in the form of assumptions and in the project design, is built into the estimates to allow for intangibles, and to provide extra assurance that the overall fluid handling capacity will exceed the requirements. A few examples of the added measure of protection are given below.

Referring back to Section 9.4, Spill Control, it can be seen that the process pad will be designed with a 1 foot high curb around it. Normally ISR process facilities have fluid retention curbs that stand 6 inches in height. Doubling the curb height significantly increases the pad's emergency fluid holding capacity. In addition, when the holding capacities of the sumps and waste storage tanks are considered, the adequacy of the designed retention capacity is clear. To further emphasize the overall fluid retention and disposal capacity of the facility, it should be remembered that as rain falls on the pads it will flow into the collection sumps and be immediately pumped into the disposal tanks and then sent to the disposal well (s). Because of this steady removal, it is highly unlikely that water would overtop the 1 foot curbs.

Another conservative assumption is the rainfall factor. It is assumed that 39,000 gallons of rain will fall on the process pads in every month of the year throughout the life of the project. This amount of rainfall is equivalent to 2.5 inches per month. Since there will be many months with just a fraction of this amount and some months that exceed 2.5 inches, the monthly fluid allowance is in excess of what will actually occur.

UEC plans to permit at least two Class I Non-hazardous waste disposal wells. The waste disposal capacity used in Table 10.1 is based on a single 250 gpm well. Having at least one additional well will significantly increase the project's disposal capacity. Thus in actuality there will be more capacity than is shown in the table.

10-1

Table 10.1

Fluid Handling Capacity vs. Fluid Disposal Requirements

Year 1 Mine Plan		1 Jan	2 Feb	3 Mar	4 Apr	5 May	6 June	7 July	8 Aug	9 Sept	10 Oct	11 Nov	12 Dec	TOTAL
Module 1	(kgals)													324,000
Module 2	(kgals)													-
Module 3	(kgals)													-
Module 4	(kgals)													-
Module 5	(kgals)													-
Module 6	(kgals)													-
Module 7	(kgals)													-
Module 8	(kgals)													-
Module 9	(kgals)													-
Module 10	(kgals)													-
Module 11	(kgals)													-
Module 12	(kgals)													-
Module 13	(kgals)													-
Module 14	(kgals)													-
Module 15	(kgals)													-
Module 16	(kgals)													-
Total Production Flow	**(kgals)**										108,000	108,000	108,000	**324,000**
Total Restoration Flow	**(kgals)**										-	-	-	-
Disposal Wells Capacity	**(kgals)**										10,800	10,800	10,800	32,400
Production Bleed	(kgals)										1,080	1,080	1,080	3,240
Other Effluents	(kgals)										696	696	696	2,087
Restoration RO Brine	(kgals)										-	-	-	-
Rain Direct	(kgals)										39	39	39	118
Total	**(kgals)**										1,815	1,815	1,815	**5,444**
Net Disposal Capacity	**(kgals)**										8,985	8,985	8,985	26,956
Total Tank Capacity	(kgals)										180	180	180	540
Emergency Capacity	(kgals)										90	90	90	270
Emergency Capacity Available	**(kgals)**										9,075	9,075	9,075	27,226

Production | Restoration | Stability — Stability Period | Reclamation — Well Field Reclamation | Admin. — Closeout Processing

10-2

Table 10.1

Fluid Handling Capacity vs. Fluid Disposal Requirements - (Continued)

Year 2 Mine Plan		13 Jan	14 Feb	15 Mar	16 Apr	17 May	18 June	19 July	20 Aug	21 Sept	22 Oct	23 Nov	24 Dec	TOTAL
Module 1	(kgals)	108,000	108,000	108,000	108,000	108,000	108,000	108,000						479,520
Module 2	(kgals)		108,000	108,000	108,000	108,000	108,000	108,000						648,000
Module 3	(kgals)							108,000	108,000	108,000	108,000	108,000	108,000	648,000
Module 4	(kgals)								108,000	108,000	108,000	108,000	108,000	540,000
Module 5	(kgals)										108,000	108,000	108,000	324,000
Module 6	(kgals)													-
Module 7	(kgals)													-
Module 8	(kgals)													-
Module 9	(kgals)													-
Module 10	(kgals)													-
Module 11	(kgals)													-
Module 12	(kgals)													-
Module 13	(kgals)													-
Module 14	(kgals)													-
Module 15	(kgals)													-
Module 16	(kgals)													-
Total Production Flow	(kgals)	108,000	216,000	216,000	216,000	216,000	216,000	216,000	216,000	216,000	216,000	216,000	216,000	2,484,000
Total Restoration Flow	(kgals)								31,104	31,104	31,104	31,104	31,104	155,520
Disposal Wells Capacity	(kgals)	10,800	10,800	10,800	10,800	10,800	10,800	10,800	10,800	10,800	10,800	10,800	10,800	129,600
Production Bleed	(kgals)	1,080	2,160	2,160	2,160	2,160	2,160	2,160	2,160	2,160	2,160	2,160	2,160	24,840
Other Effluents	(kgals)	696	696	696	696	696	696	696	696	696	696	696	696	8,346
Restoration RO Brine	(kgals)	-	-	-	-	-	-	-	7,776	7,776	7,776	7,776	7,776	38,880
Rain Direct	(kgals)	39	39	39	39	39	39	39	39	39	39	39	39	472
Total	(kgals)	1,815	2,895	2,895	2,895	2,895	2,895	2,895	10,671	10,671	10,671	10,671	10,671	72,538
Net Disposal Capacity	(kgals)	8,986	7,905	7,905	7,905	7,905	7,905	7,905	129	129	129	129	129	57,062
Total Tank Capacity	(kgals)	180	180	180	180	180	180	180	180	180	180	180	180	2,160
Emergency Capacity	(kgals)	90	90	90	90	90	90	90	90	90	90	90	90	1,080
Emergency Capacity Available	(kgals)	9,076	7,996	7,996	7,996	7,995	7,996	7,995	219	219	219	219	219	58,142

Phase bars: Production — Restoration — Stability — Stability Period — Admin. Closeout Processing — Reclamation | Well Field — Reclamation

PAA #1 / PAA #2 / PAA #3 / PAA #4

Table 10.1

Fluid Handling Capacity vs. Fluid Disposal Requirements - (Continued)

Year 3 Mine Plan		25 Jan	26 Feb	27 Mar	28 Apr	29 May	30 June	31 July	32 Aug	33 Sept	34 Oct	35 Nov	36 Dec	TOTAL
Module 1	(kgals)													-
Module 2	(kgals)	31,104	31,104	31,104	31,104	31,104								155,520
Module 3	(kgals)			31,104	31,104	31,104	31,104	31,104	31,104	31,104	31,104	31,104	31,104	155,520
Module 4	(kgals)	108,000	108,000											170,208
Module 5	(kgals)	108,000	108,000	108,000										324,000
Module 6	(kgals)		108,000	108,000	108,000	108,000	108,000	108,000						648,000
Module 7	(kgals)			108,000	108,000	108,000	108,000	108,000	108,000	108,000				648,000
Module 8	(kgals)								108,000	108,000	108,000	108,000	108,000	540,000
Module 9	(kgals)										108,000	108,000	108,000	324,000
Module 10	(kgals)													·
Module 11	(kgals)													·
Module 12	(kgals)													·
Module 13	(kgals)													·
Module 14	(kgals)													·
Module 15	(kgals)													·
Module 16	(kgals)													·
Total Production Flow	(kgals)	216,000	216,000	216,000	216,000	216,000	216,000	216,000	216,000	216,000	216,000	216,000	216,000	2,592,000
Total Restoration Flow	(kgals)	31,104	31,104	31,104	31,104	31,104	31,104	31,104	31,104	31,104	31,104	31,104	31,104	373,248
Disposal Wells Capacity	(kgals)	10,800	10,800	10,800	10,800	10,800	10,800	10,800	10,800	10,800	10,800	10,800	10,800	129,600
Production Bleed	(kgals)	2,160	2,160	2,160	2,160	2,160	2,160	2,160	2,160	2,160	2,160	2,160	2,160	25,920
Other Effluents	(kgals)	696	696	696	696	696	696	696	696	696	696	696	696	8,346
Restoration RO Brine	(kgals)	7,776	7,776	7,776	7,776	7,776	7,776	7,776	7,776	7,776	7,776	7,776	7,776	93,312
Rain Direct	(kgals)	39	39	39	39	39	39	39	39	39	39	39	39	472
Total	(kgals)	10,671	10,671	10,671	10,671	10,671	10,671	10,671	10,671	10,671	10,671	10,671	10,671	128,050
Net Disposal Capacity	(kgals)	129	129	129	129	129	129	129	129	129	129	129	129	1,550
Total Tank Capacity	(kgals)	180	180	180	180	180	180	180	180	180	180	180	180	2,160
Emergency Capacity	(kgals)	90	90	90	90	90	90	90	90	90	90	90	90	1,080
Emergency Capacity Available	(kgals)	219	219	219	219	219	219	219	219	219	219	219	219	2,630

Timeline annotations: Production | Restoration | Stability | Stability Period | Admin. | Admin. Closeout Processing | Reclamation Well Field Reclamation

Legend: PAA #1 | PAA #2 | PAA #3 | PAA #4

Table 10.1

Fluid Handling Capacity vs. Fluid Disposal Requirements - (Continued)

Year 4 Mine Plan		37 Jan	38 Feb	39 Mar	40 Apr	41 May	42 June	43 July	44 Aug	45 Sept	46 Oct	47 Nov	48 Dec	TOTAL
Module 1	(kgals)													-
Module 2	(kgals)													-
Module 3	(kgals)	Admin.	Admin.	Admin.	Admin.	Admin.	Admin.	Admin.	Admin.	Admin.	Admin.	Admin.	Admin.	-
Module 4	(kgals)	Stab. 31,104	Reclaim. 31,104	Admin. 31,104									Reclaim.	93,312
Module 5	(kgals)		Stab.	Stab. 31,104	Stab. 31,104	Stab. 31,104	Stab. 31,104	Stab. 31,104						155,520
Module 6	(kgals)							Stab. 31,104	Stab. 31,104	Stab. 31,104	Stab. 31,104	Stab. 31,104	Stab. 31,104	124,416
Module 7	(kgals)													-
Module 8	(kgals)	108,000												108,000
Module 9	(kgals)	108,000	108,000	108,000										324,000
Module 10	(kgals)		108,000	108,000	108,000	108,000	108,000	108,000						648,000
Module 11	(kgals)				108,000	108,000	108,000	108,000	108,000	108,000				648,000
Module 12	(kgals)								108,000	108,000	108,000	108,000	108,000	540,000
Module 13	(kgals)										108,000	108,000	108,000	324,000
Module 14	(kgals)													-
Module 15	(kgals)													-
Module 16	(kgals)													-
Total Production Flow	**(kgals)**	**216,000**	**216,000**	**216,000**	**216,000**	**216,000**	**216,000**	**216,000**	**216,000**	**216,000**	**216,000**	**216,000**	**216,000**	**2,592,000**
Total Restoration Flow	**(kgals)**	**31,104**	**31,104**	**31,104**	**31,104**	**31,104**	**31,104**	**31,104**	**31,104**	**31,104**	**31,104**	**31,104**	**31,104**	**373,248**
Disposal Wells Capacity	**(kgals)**	**10,800**	**10,800**	**10,800**	**10,800**	**10,800**	**10,800**	**10,800**	**10,800**	**10,800**	**10,800**	**10,800**	**10,800**	**129,600**
Production Bleed	(kgals)	2,160	2,160	2,160	2,160	2,160	2,160	2,160	2,160	2,160	2,160	2,160	2,160	25,920
Other Effluents	(kgals)	696	696	696	696	696	696	696	696	696	696	696	696	8,346
Restoration RO Brine	(kgals)	7,776	7,776	7,776	7,776	7,776	7,776	7,776	7,776	7,776	7,776	7,776	7,776	93,312
Rain Direct	(kgals)	39	39	39	39	39	39	39	39	39	39	39	39	472
Total	**(kgals)**	**10,671**	**10,671**	**10,671**	**10,671**	**10,671**	**10,671**	**10,671**	**10,671**	**10,671**	**10,671**	**10,671**	**10,671**	**128,050**
Net Disposal Capacity	**(kgals)**	**129**	**129**	**129**	**129**	**129**	**129**	**129**	**129**	**129**	**129**	**129**	**129**	**1,550**
Total Tank Capacity	(kgals)	180	180	180	180	180	180	180	180	180	180	180	180	2,160
Emergency Capacity	(kgals)	90	90	90	90	90	90	90	90	90	90	90	90	1,080
Emergency Capacity Available	**(kgals)**	**219**	**219**	**219**	**219**	**219**	**219**	**219**	**219**	**219**	**219**	**219**	**219**	**2,630**

Legend: Production | Restoration | Stability | Stability Period | Admin. Closeout Processing | Reclamation | Well Field Reclamation

PAA #1 PAA #2 PAA #3 PAA #4

Table 10.1

Fluid Handling Capacity vs. Fluid Disposal Requirements - (Continued)

Year 5 Mine Plan

	(units)	49 Jan	50 Feb	51 Mar	52 Apr	53 May	54 June	55 July	56 Aug	57 Sept	58 Oct	59 Nov	60 Dec	TOTAL
Module 1	(kgals)													.
Module 2	(kgals)													.
Module 3	(kgals)													.
Module 4	(kgals)													.
Module 5	(kgals)	Admin.	Admin.	Admin.	Admin.	Admin.	Admin.	Admin.	Admin.	Admin.	Admin.	Admin.	Admin.	.
Module 6	(kgals)	Stab 31,104				Reclaim.								31,104
Module 7	(kgals)		Stab 31,104	31,104	31,104	Stab 31,104	Stab 31,104							155,520
Module 8	(kgals)							Stab 31,104	Stab 31,104	Stab 31,104	31,104	Stab 31,104		155,520
Module 9	(kgals)												Stab 31,104	31,104
Module 10	(kgals)													
Module 11	(kgals)													-
Module 12	(kgals)	108,000												108,000
Module 13	(kgals)	108,000									108,000	108,000	108,000	324,000
Module 14	(kgals)		108,000	108,000	108,000	108,000	108,000							648,000
Module 15	(kgals)		108,000	108,000	108,000	108,000	108,000	108,000						648,000
Module 16	(kgals)								108,000	108,000	108,000	108,000	108,000	540,000
Total Production Flow	**(kgals)**	**216,000**	**216,000**	**216,000**	**216,000**	**216,000**	**216,000**	**216,000**	**216,000**	**216,000**	**216,000**	**216,000**	**216,000**	**2,268,000**
Total Restoration Flow	**(kgals)**	**31,104**	**31,104**	**31,104**	**31,104**	**31,104**	**31,104**	**31,104**	**31,104**	**31,104**	**31,104**	**31,104**	**31,104**	**373,248**
Disposal Wells Capacity	**(kgals)**	**10,800**	**10,800**	**10,800**	**10,800**	**10,800**	**10,800**	**10,800**	**10,800**	**10,800**	**10,800**	**10,800**	**10,800**	**129,600**
Production Bleed	(kgals)	2,160	2,160	2,160	2,160	2,160	2,160	2,160	2,160	2,160	1,080	1,080	1,080	22,680
Other Effluents	(kgals)	696	696	696	696	696	696	696	696	696	696	696	696	8,346
Restoration RO Brine	(kgals)	7,776	7,776	7,776	7,776	7,776	7,776	7,776	7,776	7,776	7,776	7,776	7,776	93,312
Rain Direct	(kgals)	39	39	39	39	39	39	39	39	39	39	39	39	472
Total	**(kgals)**	**10,671**	**10,671**	**10,671**	**10,671**	**10,671**	**10,671**	**10,671**	**10,671**	**10,671**	**9,591**	**9,591**	**9,591**	**124,810**
Net Disposal Capacity	**(kgals)**	**129**	**129**	**129**	**129**	**129**	**129**	**129**	**129**	**129**	**1,209**	**1,209**	**1,209**	**4,790**
Total Tank Capacity	(kgals)	180	180	180	180	180	180	180	180	180	180	180	180	2,160
Emergency Capacity	(kgals)	90	90	90	90	90	90	90	90	90	90	90	90	1,080
Emergency Capacity Available	**(kgals)**	**219**	**219**	**219**	**219**	**219**	**219**	**219**	**219**	**219**	**1,299**	**1,299**	**1,299**	**5,870**

Phase legend: Production | Restoration | Stability Period | Reclamation | Closeout Processing | Admin | Well Field Reclamation

PAA #1 | PAA #2 | PAA #3 | PAA #4

Table 10.1

Fluid Handling Capacity vs. Fluid Disposal Requirements - (Continued)

Year 6 Mine Plan

	(units)	61 Jan	62 Feb	63 Mar	64 Apr	65 May	66 June	67 July	68 Aug	69 Sept	70 Oct	71 Nov	72 Dec	TOTAL
Module 1	(kgals)													.
Module 2	(kgals)													.
Module 3	(kgals)													.
Module 4	(kgals)													.
Module 5	(kgals)													.
Module 6	(kgals)													.
Module 7	(kgals)													.
Module 8	(kgals)	Admin.	Admin.	Admin.	Admin.	Admin.	Admin.	Admin.	Reclaim.	Admin.	Admin.	Admin.	Admin.	
Module 9	(kgals)	Admin.	Admin.	Admin.	Admin.	Admin.	Admin.	Admin.		Admin.	Admin.	Admin.	Admin.	
Module 10	(kgals)	Stab. 31,104	Stab. 31,104	Stab. 31,104	Stab. 31,104	Stab.	Stab.	Stab.	Stab.	Stab.	Stab.	Stab.	Stab.	124,416
Module 11	(kgals)		31,104	31,104	31,104	38,880	38,880	38,880	38,880	38,880	38,880	38,880		155,520
Module 12	(kgals)					38,880	38,880	38,880	38,880	38,880	38,880	38,880	38,880	155,520
Module 13	(kgals)													.
Module 14	(kgals)													.
Module 15	(kgals)													.
Module 16	(kgals)													.
Total Production Flow	(kgals)	108,000												**108,000**
Total Restoration Flow	(kgals)	31,104	31,104	31,104	31,104	38,880	38,880	38,880	38,880	38,880	38,880	38,880	38,880	**435,466**
Disposal Wells Capacity	(kgals)	10,800	10,800	10,800	10,800	10,800	10,800	10,800	10,800	10,800	10,800	10,800	10,800	**129,600**
Production Bleed	(kgals)	1,080	-	-	-	-	-	-	-	-	-	-	-	1,080
Other Effluents	(kgals)	696	696	696	696	696	696	696	696	696	696	696	696	8,346
Restoration RO Brine	(kgals)	7,776	7,776	7,776	7,776	9,720	9,720	9,720	9,720	9,720	9,720	9,720	9,720	108,864
Rain Direct	(kgals)	39	39	39	39	39	39	39	39	39	39	39	39	472
Total	(kgals)	**9,591**	**8,511**	**8,511**	**8,511**	**10,455**	**10,455**	**10,455**	**10,455**	**10,465**	**10,455**	**10,465**	**10,456**	**118,762**
Net Disposal Capacity	(kgals)	**1,209**	**2,289**	**2,289**	**2,289**	**345**	**345**	**345**	**345**	**345**	**345**	**345**	**345**	**10,838**
Total Tank Capacity	(kgals)	180	180	180	180	180	180	180	180	180	180	180	180	2,160
Emergency Capacity	(kgals)	90	90	90	90	90	90	90	90	90	90	90	90	1,080
Emergency Capacity Available	(kgals)	**1,299**	**2,379**	**2,379**	**2,379**	**435**	**436**	**436**	**436**	**435**	**435**	**435**	**435**	**11,918**

Phase timeline: Production (Jan) · Restoration (Feb–Mar) · Stability Period (Apr–June) · Admin. Closeout Processing (July–Sept) · Reclamation · Well Field Reclamation (Oct–Dec)

Table 10.1

Fluid Handling Capacity vs. Fluid Disposal Requirements - (Continued)

Year 7 Mine Plan		73 Jan	74 Feb	75 Mar	76 Apr	77 May	78 June	79 July	80 Aug	81 Sept	82 Oct	83 Nov	84 Dec	TOTAL
Module 1	(kgals)													-
Module 2	(kgals)													-
Module 3	(kgals)													-
Module 4	(kgals)													-
Module 5	(kgals)													-
Module 6	(kgals)													-
Module 7	(kgals)													-
Module 8	(kgals)													-
Module 9	(kgals)													-
Module 10	(kgals)													-
Module 11	(kgals)													-
Module 12	(kgals)	38,880	38,880	36,880	38,880									155,520
Module 13	(kgals)					38,880	38,880	38,880	38,880					155,520
Module 14	(kgals)									38,880	38,880	38,880	38,880	155,520
Module 15	(kgals)													-
Module 16	(kgals)													-
Total Production Flow	(kgals)	-	38,880	38,880	38,880	38,880	38,880	38,880	38,880	38,880	38,880	38,880	38,880	466,560
Total Restoration Flow	(kgals)	38,880	38,880	38,880	38,880	38,880	38,880	38,880	38,880	38,880	38,880	38,880	38,880	466,560
Disposal Wells Capacity	(kgals)	10,800	10,800	10,800	10,800	10,800	10,800	10,800	10,800	10,800	10,800	10,800	10,800	129,600
Production Bleed	(kgals)	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Effluents	(kgals)	696	696	696	696	696	696	696	696	696	696	696	696	8,346
Restoration RO Brine	(kgals)	9,720	9,720	9,720	9,720	9,720	9,720	9,720	9,720	9,720	9,720	9,720	9,720	116,640
Rain Direct	(kgals)	39	39	39	39	39	39	39	39	39	39	39	39	472
Total	(kgals)	10,455	10,455	10,455	10,455	10,455	10,455	10,455	10,455	10,455	10,455	10,465	10,465	125,458
Net Disposal Capacity	(kgals)	345	345	345	345	345	345	345	345	345	345	345	345	4,142
Total Tank Capacity	(kgals)	180	180	180	180	180	180	180	180	180	180	180	180	2,160
Emergency Capacity	(kgals)	90	90	90	90	90	90	90	90	90	90	90	90	1,080
Emergency Capacity Available	(kgals)	435	435	435	435	435	435	435	435	435	435	435	435	5,222

PAA #1 PAA #2 PAA #3 PAA #4

Production | Restoration | Stabilize | Stability Period | Admin. Closeout Processing | Reclamation Well Field Reclamation

Table 10.1

Fluid Handling Capacity vs. Fluid Disposal Requirements - (Continued)

Year 8 Mine Plan	(units)	85 Jan	86 Feb	87 Mar	88 Apr	89 May	90 June	91 July	92 Aug	93 Sept	94 Oct	95 Nov	96 Dec	TOTAL
Module 1	(kgals)													
Module 2	(kgals)													
Module 3	(kgals)													
Module 4	(kgals)													
Module 5	(kgals)													
Module 6	(kgals)													
Module 7	(kgals)													
Module 8	(kgals)													
Module 9	(kgals)													
Module 10	(kgals)													
Module 11	(kgals)													
Module 12	(kgals)													
Module 13	(kgals)	Admin.	Reclaim.	Admin.	Admin.	Admin.	Reclaim.	Admin.	Admin.	Admin.	Reclaim.	Admin.	Admin.	
Module 14	(kgals)	Admin.	Admin.	Admin.	Admin.	Admin.	Admin.	Admin.	Admin.	Admin.	Admin.	Admin.	Admin.	
Module 15	(kgals)	Stab.	Stab.	Stab.	Stab.	Stab.	Stab.	Stab.	Stab.	Stab.	Stab.	Stab.	Stab.	155,520
Module 16	(kgals)	Stab. 38,880	38,880	38,880	38,880	38,880	38,880	38,880	38,880					155,520
Total Production Flow	**(kgals)**	**38,880**	**38,880**	**38,880**	**38,880**	**38,880**	**38,880**	**38,880**	**38,880**	-	-	-	-	**311,040**
Total Restoration Flow		-	-	-	-	-	-	-	-	-	-	-	-	
Disposal Wells Capacity	**(kgals)**	**10,800**	**10,800**	**10,800**	**10,800**	**10,800**	**10,800**	**10,800**	**10,800**	**10,800**	**10,800**	**10,800**	**10,800**	**129,600**
Production Bleed	(kgals)	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Effluents	(kgals)	696	696	696	696	696	696	696	696	-	-	-	-	5,564
Restoration RO Brine	(kgals)	9,720	9,720	9,720	9,720	9,720	9,720	9,720	9,720	-	-	-	-	77,760
Rain Direct	(kgals)	39	39	39	39	39	39	39	39	39	39	39	39	472
Total	**(kgals)**	**10,455**	**10,455**	**10,455**	**10,455**	**10,455**	**10,455**	**10,455**	**10,455**	**39**	**39**	**39**	**39**	**83,796**
Net Disposal Capacity	**(kgals)**	**345**	**345**	**345**	**345**	**345**	**345**	**345**	**345**	**10,761**	**10,761**	**10,761**	**10,761**	**45,804**
Total Tank Capacity	(kgals)	180	180	180	180	180	180	180	180	180	180	180	180	2,160
Emergency Capacity	(kgals)	90	90	90	90	90	90	90	90	90	90	90	90	1,080
Emergency Capacity Available	**(kgals)**	**435**	**435**	**435**	**435**	**435**	**435**	**435**	**435**	**10,851**	**10,851**	**10,851**	**10,851**	**46,884**

Legend (phases): Production | Restoration | Stability | Stability Period | Closeout Processing | Admin. | Reclamation Well Field | Reclamation

PAA #1 | PAA #2 | PAA #3 | PAA #4

Table 10.1

Fluid Handling Capacity vs. Fluid Disposal Requirements - (Continued)

Year 9 Mine Plan		97 Jan	98 Feb	99 Mar	100 Apr	101 May	102 June	103 July	104 Aug	105 Sept	106 Oct	107 Nov	108 Dec	TOTAL
Module 1	(kgals)													
Module 2	(kgals)													
Module 3	(kgals)													
Module 4	(kgals)													
Module 5	(kgals)													
Module 6	(kgals)													
Module 7	(kgals)													
Module 8	(kgals)													
Module 9	(kgals)													
Module 10	(kgals)													
Module 11	(kgals)													
Module 12	(kgals)													
Module 13	(kgals)													
Module 14	(kgals)	Admin.	Reclaim.	Admin.	Admin.	Admin.	Reclaim.	Admin.	Admin.	Admin.	Reclaim.			
Module 15	(kgals)	Admin.	Admin.	Admin.	Admin.	Admin.	Admin.	Admin.	Admin.	Admin.				
Module 16	(kgals)	Sta…	Sta…											
Total Production Flow	**(kgals)**	·	·	·	·	·	·	·	·	·	·	·	·	·
Total Restoration Flow	**(kgals)**	·	·	·	·	·	·	·	·	·	·	·	·	·
Disposal Wells Capacity	(kgals)	10,800	10,800	10,800	10,800	10,800	10,800	10,800	10,800	10,800	10,800			108,000
Production Bleed	(kgals)	·	·	·	·	·	·	·	·	·	·			·
Other Effluents	(kgals)	·	·	·	·	·	·	·	·	·	·			·
Restoration RO Brine	(kgals)													
Rain Direct	(kgals)	39	39	39	39	39	39	39	39	39	39			393
Total	**(kgals)**	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**			**393**
Net Disposal Capacity	(kgals)	10,761	10,761	10,761	10,761	10,761	10,761	10,761	10,761	10,761	10,761			107,607
Total Tank Capacity	(kgals)	180	180	180	180	180	180	180	180	180	180			1,800
Emergency Capacity	(kgals)	90	90	90	90	90	90	90	90	90	90			900
Emergency Capacity Available	**(kgals)**	10,851	10,851	10,851	10,851	10,851	10,851	10,851	10,851	10,851	10,851			108,507

Phase timeline: Production — Restoration — Stability Period — Closeout Processing — Admin. — Reclamation Well Field Reclamation

PAA #1 PAA #2 PAA #3 PAA #4

Other compelling reasons for not relying on a single well are summarized below.

- In the unlikely event of losing the first well, a second or third well would provide vital backup. Having immediate backup gives assurance that project operations, uranium recovery and restoration, will not be interrupted.
- Proper maintenance of a waste disposal well may involve a workover that would require taking the well off line for a period of time. Again, having a backup well would allow activities to continue without interruption.
- Having a surplus of disposal capacity allows for aggressive groundwater restoration. UEC is committed to restoring groundwater as expeditiously as possible.

In summary, Table 10.1 shows that the project will have a surplus of capacity to handle and dispose fluids.

11.0 Hydrologic Testing

The affixed seal covers the entire contents of this section.

November 30, 2007

11.0 Hydrologic Testing

This section describes the hydrologic testing procedures to be used for Uranium Energy Corp.'s (UEC) production areas. Each production area will be surrounded by a monitoring well ring that will serve to detect possible fluid excursions. Monitor well design will be in accordance with 30 TAC 331 Subchapter F, Rule § 331.103 Production Area Monitor Wells.

Aquifer pumping tests will be performed to determine the degree of hydrologic connection between aquifers, determine and locate any possible no flow or recharge boundaries, and verify the hydraulic connection between the production zone and the production zone monitoring wells (i.e. verify that the monitoring wells have been completed in the proper strata). The following sub-sections include descriptions of aquifer test preparation, test procedures, equipment, schedule, and procedures for analysis and summary of the test results.

11.1 Hydrologic Test Preparation

The production area geology will be mapped using data from numerous exploration logs and cross-sections. This information, along with data from baseline wells, will be used to guide the installation of the monitoring wells. The geophysical data just noted will also be used to determine the depths and screened intervals of the monitoring wells.

Well logs from the new wells drilled for the test will be compared and integrated into the geologic characterization of the production area. This will ensure that the proper strata are screened. A survey will be performed to determine the elevations of the top of casing and the location of each well used in the test.

11.1.1 Monitoring Wells

As noted above, monitoring wells will be located in accordance with TCEQ regulatory requirements. The observation wells will be distributed as uniformly as possible around the pumped well and at variable distances from the pumped well. This will ensure that possible hydraulic boundary conditions will be detected by the aquifer test. Monitoring wells will be designed to allow downhole access for water level recording devices.

Monitor wells will be completed in the sands overlying the production zone. Water level response will be monitored to determine the sealing nature of intervening low permeability shale deposits.

All wells will remain open to the water bearing zone for the production area during the entire test, and penetrate the entire sand interval so that the flow toward the pumping well is horizontal and drawdown values are not affected by partial penetration. Well numbers and reference points (top of casing) for water level measurements will be recorded and marked on each well casing.

11.1.2 Antecedent Aquifer Conditions

Approximately 48-hours before the pumping test begins, on-site activities that could impact the aquifer water levels such as drilling and pumping will be stopped to allow the aquifer to return to static conditions. Water level measurements will be taken, either with continuous water level recorders or periodically with electric lines or tape, in the pumping well and in all observation wells 24 hours prior to the test to establish the initial static water level.

Water levels will be measured to the nearest 0.01 foot. Barometric pressure will also be recorded prior to the test to establish any background trends.

After the aquifer has stabilized, trends or fluctuations due to changes in barometric pressures or rainfall events will be noted and compared to the water level readings. Outside influences such as pumpage of nearby wells and changes in stream flow, will be

observed, recorded, and if possible, controlled to the extent that they have little or no influence on the groundwater level during the test. If the water levels fluctuate during this time interval, observations will be continued until the trend is clearly established. During the data analysis phase, the water level measurements will be corrected if necessary.

11.2 Hydrologic Test Procedures

Aquifer testing will be performed to provide in-situ information regarding the hydraulic conductivity and the storativity of the production area aquifers. In accordance with TCEQ recommendations, no fewer than one pumping well and three observation wells will be used.

11.2.1 Hydrologic Test Equipment

Well data from the geologic characterization of the production area will be used to establish the necessary requirements for all equipment including depths, and sizing of piping, pumps, and electric lines for water level measurement. The pumping test will require a generator, an electric submersible pump (5 to 7.5 horsepower range), a rig to set the pump, 2-inch PVC line, piping, valves, and in-line totalizing flow meters to record the number of gallons pumped. To maintain a constant rate, the discharge pipe will be fitted with a valve and the flow rate will be determined by monitoring the time required to produce a certain volume as recorded by the in-line totalizer.

Water levels and time of measurement will be recorded with continuous water level measuring devices (dataloggers) and downhole pressure transducers. Barometric pressure will also be monitored at the surface with a pressure transducer device. Care must be taken to keep the transducer at constant temperature conditions.

All of the data will be stored digitally to facilitate the data analysis. Drawdown and recovery will be recorded in the pumped well and in the observation wells. Water levels and times may be recorded using an e-lines or tapes in certain wells that are farthest from the pumped well or in overlying aquifers.

11.2.2 Hydrologic Test Schedule

The flow rate will be held constant during the test and the well will be pumped at approximately 75% of its maximum yield to ensure that optimal data quality will be obtained for analysis. Although it is anticipated that the pumping rate will be approximately 30 gallons per minute (gpm), actual rate will be determined in the field. Water level monitoring of the drawdown and recovery will be performed. Rapid changes in the static water level will occur when the pumping test is started and when pumping ends and recovery begins. Therefore, readings will be taken as often as possible at these times in as many observation wells as possible. Automatic data-loggers will typically sample every few seconds during the beginning of a test phase. A typical timetable for e-line or tape measurements is:

Time Since Test Begins (minutes)	Frequency of Measurement
0 to 2	every 30 seconds
5 to 5	every minute
5 to 10	every 2 minutes
10 to 30	every 5 minutes
30 to 60	every 10 minutes
60 to 120	every 20 minutes
120 to end of test	every hour

The well will be pumped at a constant discharge rate until radial flow is achieved and the drawdown stabilizes at the observation wells. The anticipated pumping time will be 1440 minutes, or 24 hours, at a constant discharge rate. Recovery data will be collected for 24 hours following the test or until water levels have recovered to within 90% of the pre-testing level.

It will be important to determine if no flow or recharge boundaries are encountered during the test.

Data obtained during the test will be monitored and plotted in the field to determine if any such trends occur that may require changes in the test schedule. If a pump fails, the water level recovery will be monitored.

11.2.3 Procedures for Analysis and Summary of the Test Results

Data collected will be analyzed using established and accepted hydrogeologic methods to determine transmissivity, storativity, and permeability of the production zone aquifer. Commercial software will be used to efficiently analyze the large number of individual drawdown and recovery responses from the test.

11.3 Barometric Pressure Corrections

Prior to the data analysis, barometric pressure corrections will be made to the data, if necessary, using the trend data obtained during the pretest monitoring phase. Pressure changes due to atmospheric fluctuations, ΔP_{atm}, increase or decrease the measured drawdown. For example, if the barometric pressure increases, the recorded drawdown will be greater than the actual drawdown. This means that the amount of drawdown, Δh, attributed to an increase in atmospheric pressure, ΔP_{atm}, must be subtracted to obtain the actual drawdown.

In a confined aquifer, the elasticity of the aquifer materials must be considered. Some of the atmospheric pressure increase results in an increase in the effective stress in the aquifer. Therefore, the barometric efficiency (BE) must be determined as follows Todd (1980):

$$BE = (\Delta h \times \rho g_{water}) / \Delta P_{atm}$$

Where the term BE is the barometric efficiency and ρg_{water} is the specific weight of water. The corrected drawdown for rising barometric pressure is then calculated as:

$$\Delta h_{corrected} = \Delta h_{recorded} - (BE \times \Delta P_{atm}/\rho g_{water})$$

Similarly, corrections would be required for decreases in barometric pressure and also for atmospheric impacts to the recovery data.

11.3.1 Well Test Data Analysis

There are several software packages available for efficient analysis of well test data. These programs can speed up the analysis time using rapid plotting routines and on screen line and curve fitting techniques, but cannot automatically analyze the data with 100% accuracy. Hydrogeologic judgment must be used by the analyst to pick the interpretation and analysis method that best fits the data.

Generally, the corrected drawdown and recovery data are plotted and a determination is made as to the quality of the data. Then the appropriate aquifer model is chosen (e.g. artesian, leaky artesian, unconfined, etc.) and the data are fitted to type curves (Theis, 1935; Hantush, 1960) and/or straight line fits to the late time data (Cooper and Jacob, 1946). Using appropriate techniques, the well test data will be analyzed to determine:

- Hydraulic conductivity, transmissivity, and storage coefficient at each monitoring well;

- Porosity of selected, representative wells determined from core analysis, electric logs, or other methods;

- Degree of hydrologic communication between aquifers;

- Hydrologic connection between the Production Zone and its monitor wells verified;

- Hydrologic boundaries and recharge areas locations (if any);

- The hydraulic gradient for each aquifer.

References

Cooper, H. H. and C. E. Jacob, 1946, A generalized graphical method for evaluating formation constants and summarizing well field history, Trans. American Geophysical Union, v. 27 pp. 526-534.

Hantush, M. S., 1960, Modification of the theory of leaky aquifers, Journal of Geophysical Research, v. 65, pp. 3713-3725.

Theis, C. V., 1935, The relation between the lowering of the potentiometric surface and the rate and duration of discharge of a well using groundwater storage, Trans. American Geophysical Union, 16th Annual Meeting, pp 519-524.

Todd, D. K., 1980, Groundwater Hydrology, second edition, John Wiley and Sons, New York, 535 p.

Chapter 12.0 Restoration Effectiveness and Restoration Demonstration

7-27-2007

The affixed seal covers the entire contents of this chapter.

12.0 Restoration Effectiveness and Restoration Demonstration

The technology for restoring groundwater back to levels consistent with baseline involves using native groundwater sweep and reverse osmosis (R.O). The effectiveness of current-day restoration has been enhanced by many years of experience. Two major improvements include: 1) initiating restoration as soon as possible following uranium recovery in a given production area and 2) using R.O. during the mining process to keep competing ions from becoming too concentrated.

A very important factor in achieving successful restoration is to have a proper baseline. In the early days of the industry not enough attention was given to developing a baseline that was representative of the area to be mined. Instead of establishing an adequate number of baseline wells in the potential mine area (the area that must be restored to pre-mining conditions), wells were placed far outside the mineralized area. As a result, the average, low and high values established for baseline were not representative of the mineralized zone. Because a disproportionate number of baseline wells were placed in good water, this had the obvious affect of mischaracterizing the actual water quality of the mine area - - it erroneously showed that water quality in the mine was of a higher quality. This in turn set up artificially low restoration targets for a number of constituents and made it impossible to achieve the desired goals. Recognizing this flaw, operators are making a much better effort to properly characterize pre-mining groundwater quality in the areas where production will likely occur.

Although UEC believes that modern day restoration has a much higher likelihood of successfully returning the groundwater to a quality consistent with pre-mining conditions, a restoration demonstration will be conducted at the start of operations. The demonstration will be a small-scale pilot operation designed to closely approximate the larger-scale activities. The wells, the injection fluid, the restoration technique and all other factors will be shaped to match the commercial operation. UEC will complete the restoration demonstration within 18 months following the startup of operations. The results of the demonstration will be submitted to TCEQ for review and comment.

Chapter 13.0 Restoration Cost Estimate
Well Plugging

The affixed seal covers the entire contents of this chapter.

[Seal: STATE OF TEXAS — HARRY L. ANTHONY IV — 47592 — REGISTERED PROFESSIONAL ENGINEER]

Jan. 30, 2008

13.0 Restoration: Well Plugging and Abandonment

The cost estimate given here is preliminary and will of course become more refined when UEC is nearer to completing the first production areas. The total estimated cost was derived by multiplying the total footage for all wells by a cost per foot. As required by TCEQ, the cost estimate assumes that a third party would be contracted for this work.

The cost per foot reflects labor, equipment, per diem, cement and materials. The most current surety posted at TCEQ for this work is approximately $1.10 per foot. The estimated total footage that UEC expects to have in cased wells is 798,600 feet. It should be noted that this estimate is a little on the high side to allow for contingencies. As noted above, the total footage includes all wells (injection, production and monitor wells).

UEC is planning recovery operations in four distinct sand units; the A, B, C and D Sands. Following is a breakdown of the estimated number of wells that would be completed in the initial production areas.

	Total Depth (Feet)	Estimated Number of Wells	Total Footage (Feet)
A-Sand:	110	245	26,950
B-Sand:	190	360	68,400
C-Sand	245	566	138,670
D-Sand	355	963	341,865
Total:	----	2134	575,885

Multiplying the total footage by a cost factor of $1.10/foot gives a total estimated cost of $633,470.00. Prior to drilling any Class III wells after the permit is issued, UEC will post financial surety in a form acceptable to TCEQ. The rules on financial surety are given in 30 TAC §331.142-144.

13-1

According to § 27.073 (a-1), A person to whom an in situ uranium mining injection well, monitoring well, or production well permit is issued shall be required by the commission to maintain a performance bond or other form of financial security to ensure that an abandoned well is properly plugged. Detailed requirements concerning financial surety are given in Title 30 of the Texas Administrative Code ("30 TAC") Chapter 331. According to Subchapter A, § 331.15 Financial Assurance Required, injection is prohibited for Class I and Class III wells which lack financial assurance. Chapter 37, Subchapter Q, § 37.7021 of 30 TAC requires an owner or operator subject to this subchapter to establish financial assurance for plugging and abandonment of Class III wells. Chapter 37, Subchapter Q, Financial Assurance for Underground Injection Control Wells establishes the requirements for demonstrating financial assurance for plugging and abandonment (see 30 TAC § 37.7001). Finally, additional financial assurance requirements are detailed in 30 TAC Subchapter I, §§ 331.142, 331.143 and 331.144. These rules require a permittee to: (1) secure and maintain adequate surety for plugging and abandonment as specified in Chapter 37, Subchapter Q; (2) prepare a plugging and abandonment cost estimate reflecting the period in the operation's life when plugging and abandonment would be most expensive; and (3) maintain the latest cost estimate as prepared under § 331.143(a) during the operational life of the project; and (4) certify and obtain certification from an independent licensed professional engineer or licensed professional geoscientist that plugging and abandonment have been accomplished in accordance with an approved plugging and abandonment plan.

Additionally, at least 60 days prior to drilling wells, UEC will post a form of financial assurance listed in 30 TAC § 37.7021. At this time, UEC anticipates that the surety mechanism would be: (1) a fully funded or pay-in trust; (2) a surety bond guaranteeing payment; (3) a surety bond guaranteeing performance; or (4) an irrevocable standby letter of credit.

During operations, UEC will submit plugging and abandonment cost estimates for the anticipated number of wells needed as the project goes forward. The cost estimate will be in current dollars and will include labor, materials, equipment, supplies and per diem.

Revised: February 26, 2008

The estimate will be based on a third party completing the work. Plugging will be in accordance with 30 TAC § 331.46, Closure Standards. The plugging plan in Section 8.3 calls for cementing wells from total depth to the surface. After the cement has dried, the casing will be cut off approximately three feet below the surface. The excavation will then be backfilled with native soil and graded to approximate the natural contour of the land. Prior to beginning plugging and abandonment, UEC will notify TCEQ. After receiving written permission from TCEQ to proceed, UEC will begin plugging. Closure will proceed according to 30 TAC § 331.86. As described in Section 331.86, an operator must complete plugging and abandonment within 120 days after acknowledgement of final restoration. When closure has been completed, UEC will notify TCEQ. TCEQ will inspect the site to certify that closure has been accomplished in accordance with the permit terms.

14.0 Proposed Aquifer Exemption

Prior to the start of operations, an Aquifer Exemption must be issued by the U.S. EPA through TCEQ. The federal criteria for exempted aquifers are given in 40 CFR §146.4, and the corresponding TCEQ criteria can be found in 30 TAC §331.13 Exempted Aquifer.

The extent of the aquifer exemption is shown on all of the cross-sections (see Figures 6.8a through 6.13). As shown, the exempted portion would extend from the base of the D Sand to the top of the A Sand. The ore delineation program that UEC is engaged in clearly demonstrates that commercial-grade uranium deposits exist in all four sand units. As cross-sections (6.8 through 6.13) show, each sand unit is confined on the top and the bottom by substantial aquicludes. With regard to overlying and underlying aquifers, please refer to the cross-sections to see that an overlying aquifer does not exist above the A Sand production zone. The cross-sections also illustrate that within the prospective production areas, overlying non-production zone aquifers, do not exist. The reason for this is that all four sand units contain commercial amounts of uranium. The deepest production zone (D-Sand) has a substantial confining layer between it and deeper aquifers. This confining layer exists throughout the permit area (see cross-sections). At this stage of project development, the lateral extent of the aquifer exemption area would encompass all of the production areas shown on Figure 1.3 Project Map. Because project development is ongoing, additional aquifer exemption areas will be needed in the permit area.